PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant:	KENNETH D. BEER et al.	**Examiner:**	Torres Vealzquez, N.
Serial No.:	09/597,453	**Group Art Unit:**	1774
Filed:	June 20, 2000		
For:	PULTRUDED PART AND METHOD OF PREPARING A REINFORCEMENT MAT FOR THE PART	**Docket No.**	26998-241416

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

I CERTIFY THAT, ON SEPTEMBER 11, 2003, THIS PAPER IS BEING DEPOSITED WITH THE U.S. POSTAL SERVICE AS FIRST CLASS MAIL IN AN ENVELOPE ADDRESSED TO THE COMMISSIONER FOR PATENTS, P. O. BOX 1450, ALEXANDRIA, VA 22313-1450.

Kristine Stefano

Kristine Stefano

TRANSMITTAL LETTER

Enclosed for filing are the following papers in connection with the above-identified patent application:

- Appeal Brief in triplicate (20 pages each copy)
- Request for One-Month Extension of Time (1 page)
- Credit Card Payment Form in the amount of $ $ 430.00 for Appeal Brief Filing Fee ($320.00) and One-Month Extension of Time Fee ($110.00)
- Postcard
  A self-addressed return postcard in accordance with M.P.E.P. Section 503 itemizing all of the above-referenced documents filed with the United States Patent and Trademark Office.

In the event the amount submitted herewith is incorrect in any respect, the Commissioner is hereby authorized to charge the balance needed to our Deposit Account No. 06-0029 and is requested to notify us of the same.

Respectfully Submitted,

KENNETH D. BEER et al.

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APPEAL BRIEF

The Patent Office received a Notice of Appeal in this application on June 11, 2003, from the decision of the Examiner in the final rejection dated February 12, 2003, and the advisory action dated April 17, 2003. The present application includes claims that have been finally rejected. Accordingly, this Appeal is proper and Applicants' Brief in support of this Appeal follows.

REAL PARTY IN INTEREST

The real party in interest in this Appeal is Pella Corporation (Pella), the assignee of all rights to the invention disclosed in the subject application. The assignment of the inventors' rights to Pella was recorded in the United States Patent and Trademark Office on June 20, 2000, at Reel 010913, Frame 0850.

RELATED APPEALS AND INTERFERENCES

There are no known appeals or interferences related to this Appeal.

STATUS OF THE CLAIMS

The present application claims priority under 35 U.S.C. § 119 from provisional application Serial No. 60/155258, filed June 21, 1999.

The present application was originally filed with Claims 1-64. Claims 65-120 were added in a Preliminary Amendment dated April 18, 2001. In a second Preliminary Amendment dated July 16, 2001, Applicants amended Claim 79.

Claims 1-120 were subject to a three-way restriction requirement dated February 26, 2002. The Examiner restricted the claims of the above-referenced application to the following groups:

I. Claims 1-12 and 97-103 drawn to a pultruded part;
II. Claims 13-28 and 65-96 drawn to a mat; and
III. Claims 29-64 and 104-120 drawn to a method of making a mat.

Applicants elected to prosecute the claims of Group II (Claims 13-28 and 65-96) without traverse. Claims 1-12, 29-64 and 97-120 were withdrawn from consideration.

The Examiner rejected Claims 13-28 and 65-96 in an Office Action dated July 23, 2002. In an Amendment dated December 02, 2002, Applicants added new Claims 121-126. All pending Claims 13-28, 65-96 and 121-126 were rejected in a Final Office Action dated February 12, 2003. By an Amendment After Final Rejection dated April 07, 2003, Applicants proposed amendments to Claims 13, 27, 65 and 85 to place the application in condition for allowance or in better condition for appeal. In an Advisory Action dated April 17, 2003, the Examiner indicated that the presented amendments would not be entered. In a Supplemental Advisory Action dated May 9, 2003, however, the Examiner stated that the proposed amendments would be entered for purposes of Appeal.

Accordingly, Claims 13-28, 65-96 and 121-126 are the subject of this Appeal. A copy of these Claims including the amendments presented in the Amendment After Final Rejection is provided in the Appendix.

STATUS OF AMENDMENTS

In a second Preliminary Amendment dated July 16, 2001, Applicant

amended Claim 79. Applicants also filed an Amendment After Final Rejection on April 07, 2003, in which amendments to Claims 13, 27, 65 and 85 were presented. In an Advisory Action dated April 17, 2003, the Examiner indicated that the presented amendments would not be entered. In a Supplemental Advisory Action dated May 9, 2003, however, the Examiner stated that the proposed amendments would be entered for purposes of Appeal. Therefore, the claims provided in the Appendix reflect the amendments presented in the second Preliminary Amendment and the Amendment After Final Rejection.

SUMMARY OF INVENTION

The present invention is directed to a reinforcing mat for use in pultruded parts. (Specification, page 1, lines 12-14). The reinforcing mat is made up of a number of layers, including a layer having fibers which extend transversely of the mat, fibers that are oriented longitudinally of the mat, and a batting layer of polymeric fibers that extend into, and interconnect, the mat layers. (Specification, page 1, lines 14-18). In some embodiments, a layer of fibers is arranged at an angle relative to the longitudinal fibers. (Specification, page 4, lines 23-28).

The first layer of continuous, generally longitudinally extending fibers provide longitudinal strength and increased modulus to the mat. (Specification, page 4, lines 18-20). The second layer of generally transverse reinforcement fibers is provided in association with the first layer and oriented at an angle to provide transverse strength and increased modulus to the mat and ultimately to the final pultruded part. (Specification, page 4, lines 20-23). A batting layer is also provided with at least a portion of the batting fibers extending through the thickness of the mat layers to interconnect the fibers of all the layers and thereby increase the shape-retaining capability of the mat during pultrusion of the part. (Specification, page 4, lines 28-30 to Page 5, lines 1-2).

In another embodiment of the present invention, the reinforcing mat also includes a third layer, having obliquely arranged fibers, with certain of the transport fibers extending diagonally in one direction with respect to the first layer and other fibers extending diagonally at an opposite, essentially equal angle. (Specification, page 4, lines

23-27). These obliquely arranged fibers provide shear strength and increased modulus, anti-skewing resistance and stiffness to the mat. (Specification, page 4, lines 27-28). In yet another embodiment, a quantity of binding agent is provided to bond all of the layers of the mat together. (Specification, page 5, lines 6-7).

ISSUES

Claims 13-28, 65-96 and 121-126 were rejected by the Examiner under 35 U.S.C. §103(a) as being unpatentable over U.S. Pat. No. 5,055,242 (Vane) in view of U.S. Pat. No. 5,910,458 (Beer).

In view of these rejections, the issue on appeal is whether claims 13-28, 65-96 and 121-126 are patentable over Vane in view of Beer

GROUPING OF CLAIMS

The claims stand and fall together.

ARGUMENTS

Claims 13-28, 65-96 and 121-126 stand rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Pat. No. 5,055,242 to Vane (Vane) in view of U.S. Pat. No. 5,910,458 to Beer et al. (Beer). The Office Action dated February 12, 2003 asserts that Vane and Beer are from the same field of endeavor, and both of them teach reinforcement articles with layers of materials that are stitch bonded. The Office Action further states that it would have been obvious to modify the reinforcing material and provide it with a layer that contains entangling fibers, such as staple material of a synthetic resin material as the layer of thermoplastic material reported in Vane's invention with the motivation of ensuring that the reinforcing material can be wetted during a pultrusion process as disclosed by Vane.

The Advisory Action dated May 9, 2003 clarifies the rejection as being directed to adding the batting layer of Beer to the stitching layer of Vane. The stated motivation for this redundant structure is that it would further stabilize the structure.

Applicants respectfully submit, however, that there is no motivation to add the needled batting material of Beer to the stitched structure of Vane. Applicants further submit that there is no motivation to substitute the needled batting material of Beer for the stitched structure of Vane.

1. U.S. Patent No. 5,055,242 to Vane.

Vane teaches a continuous process for forming reinforced plastic articles of consistent quality and strength. One of the deficiencies in the prior art identified by Vane is the inconsistency of reinforcing mats made with non-woven fibers. In particular, Vane teaches away from mats of non-woven fibers:

> Moreover, with mats of non-woven fibres the distribution of the fibres is random so that the strength characteristics of the reinforcement in any particular direction are unpredictable. (Vane, column 1, lines 20-23)(Emphasis added).

Vane also rejects the use of chopped reinforcing fibers:

> It is also known to mould reinforced plastics articles by mixing chopped reinforcing fibres in a synthetic resin material and molding the resulting mixture in a closed mould. This method suffers from the disadvantage that the chopped reinforcing fibres are randomly distributed and randomly oriented in the finished article with the result that the article may contain resin-rich and reinforcing fibre-rich areas whereby the quality and mechanical properties of the article can be unpredictable. (Vane, column 1, lines 28-37).

Vane overcomes these deficiencies in the prior art by disclosing a reinforcing material having a plurality of superimposed layers of unidirectional non-woven yarns or threads laid side-by-side. The yarns in at least some of the different layers extend in different directions. The layers of reinforcing material are stitched together by knitting so as to secure the yarns in fixed positions relative to one another.

Vane also teaches the use of at least one sheet of thermoplastic material interposed between at least two of the reinforcing material layers, preferably before the layers are stitched together. (Vane, column 3, lines 20-25). The reinforcing material and the interposed thermoplastic material are then heated to soften the thermoplastic material and wet the reinforcing material. (Vane, column 3, lines 25-29).

2. U.S. Patent No. 5,910,458 to Beer.

Beer teaches a reinforcing mat adapted to strengthen a thermosetting matrix material. The mat includes a primary layer of generally parallel, essentially continuous glass fiber strands oriented generally parallel to a longitudinal axis of the mat. A secondary layer includes a plurality of randomly oriented chopped and/or continuous glass fiber strands. (Beer, column 14, lines 3-29). The strands of the primary layer are entangled with the strands of the secondary layer to form the reinforcing mat.

3. There is no Motivation for the Proposed Combination.

A *prima facie* case of obviousness is not established merely by employing components in combination for their known functions. Instead, a teaching, suggestion, or incentive supporting the combination is required to establish a *prima facie* case. *In re Geiger*, 815 F.2d 686, 688 (Fed. Cir. 1987). Thus, it is not relevant that all of the elements of the claimed invention may be found in Vane and Beer. What must be found obvious to sustain the present rejection is the claimed combination. *Kimberly-Clark Corp. v. Johnson & Johnson*, 745 F.2d 1437, 1448, 223 USPQ 603, 609-10 (Fed. Cir. 1984).

The prior art items themselves must suggest the desirability and thus the obviousness of making the combination without the slightest recourse to the teachings of the present application. Without such independent suggestion, the prior art is to be considered as merely inviting unguided and speculative experimentation, which is not the standard with which obviousness is determined. *Amgen, Inc. v. Chugai Pharmaceutical Co., Ltd.*, 927 F.2d 1200, 18 USPQ2d 1016 (Fed. Cir. 1991). Therefore, "[w]hen determining the patentability of a claimed invention which combines two known elements, 'the question is whether there is something in the prior art as a whole to suggest the desirability, and thus the obviousness, of making the combination.'" See *In re Beattie*, 974 F.2d 1309, 1311-12, 24 USPQ2d 1040, 1042 (Fed. Cir. 1992) (quoting *Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co.*, 730 F.2d 1452, 1462, 221 USPQ 481, 488 (Fed. Cir. 1984)). It is also well established law that one cannot pick and choose among individual parts of assorted prior art

references as a mosaic to recreate a facsimile of a claimed invention in order to show the alleged obviousness of this invention. *Akzo N.V. v. United States International Trade Commission*, 808 F.2d 1471, 1481, 1 U.S.P.Q.2d 1241, 1246 (Fed. Cir. 1986).

In order to sustain the present rejection, some suggestion or motivation must be identified in Vane to add an entangle secondary layer of chopped or continuous fibers, as taught in Beer, to the stitched layers of unidirectional non-woven yarns taught in Vane. For the reasons discussed below, Applicants believe that Vane not only lacks such suggestion or motivation, but rather, teaches away from the proposed redundant structure. Applicants further submit that there is no motivation to substitute the needled batting material of Beer for the stitched structure of Vane.

a. Vane Teaches Away from the Proposed Combination.

Teaching away from the claimed invention is the antithesis of the prior art suggesting that the person of ordinary skill go in the claimed direction. Essentially, teaching away from the art is a per se demonstration of lack *of prima facie* obviousness. *In re Dow Chemical Co.*, 837 F.2d 469, 5 USPQ2d 1529 (Fed. Cir. 1988); *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988); *In re Nielson*, 816 F.2d 1567, 2 USPQ2d 1525 (Fed. Cir. 1987).

Vane asserts that the random nature of non-woven fibers results in unpredictable strength characteristics. (Vane, column 1, lines 20-23). Vane also rejects the use of chopped reinforcing fibers. (Vane, column 1, lines 28-37). Vane overcomes the noted deficiencies in the prior art by teaching a reinforcing material having a plurality of superimposed layers of unidirectional non-woven yarns or threads laid side-by-side that are stitched together. Consequently, Vane teaches away from using non-woven fibers in reinforcing materials, either alone or in combination with stitching.

The present rejection necessitates, however, adding a secondary layer of chopped or continuous fibers, as taught in Beer, to the stitched layers of unidirectional non-woven yarns taught in Vane. This proposed modification is directly contrary to Vane's teaching. Vane's rejection of non-woven structures along with Vane's express selection of

stitching to secure the superimposed layers of unidirectional non-woven yarns, clearly establishes that Vane lacks any suggestion or motivation for the proposed combination. The same rationale also establishes that Vane lacks any motivation for eliminating the stitching that goes to the heart of his invention and substituting the layer of non-woven fibers taught in Beer. Absent such suggestion or motivation in Vane, the rejection fails.

b. Beer Teaches Away from the Proposed Combination.

Although the pending rejection is based on adding the non-woven needled layer of Beer to the stitched structure of Vane, Applicants submit that Beer also teaches away from the proposed combination. Consequently, there is not teaching or suggestion in Beer that cures the defect in the present rejection.

Beer acknowledges that the prior discloses the use of non-woven chopped glass strands and parallel glass strands stitched together. (Beer, column 1, lines 40-47). In assessing this prior art, Beer asserts that:

> None of the foregoing references address the problems encountered in molding thermosetting composites, such as wet-out and compatibility between the reinforcement and the thermosetting matrix material. (Beer, column 1, lines 62-65).

Applicants submit that Beer clearly considered, and rejected, the use of stitching to secure parallel glass strands in a reinforcing structure. Beer does not teach stitching because the disclosed needled batting material sufficiently secures the reinforcing fibers. Consequently, Applicants submit that Beer does not contain any suggestion or motivation for the proposed combination.

c. Vane and Beer Solve the Problem of Increased Strength without the Proposed Redundant Structure.

The stated motivation for the proposed combination of Vane and Beer is that "the inclusion of a batting material as taught by Beer et al. provides further strength to the mat of Vane." (Office Action dated 2/12/03, page 2)(Emphasis added). This alleged motivation for the proposed combination is lacking, however, because both Vane and Beer

teach methods and structures that provide increased strength, without the proposed redundant structure. The mechanisms for providing increased strength in Vane and Beer also teach away from the proposed combination.

Vane solves the problem of increased strength by varying the number of layers and the orientation of the yarns or threads in the individual layers.

> It will be understood that the number of layers in the reinforcing material and the orientation of the yarns or threads 10 in the individual layers may be varied as required to provide a multi-axial reinforcing material of required thickness and strength characteristics. (Vane, column 5, lines 37-42)(Emphasis added).

Thus, Vane teaches a solution to the problem of strength other than the proposed redundant structure, teaching away from the proposed redundant structure.

Similarly, Beer solved the problem of increased strength by adding layers of glass fiber strands. Figure 1 of Beer illustrates an embodiment with a single layer of glass fiber strands 18, while Figure 3 illustrates a plurality of layers of glass fiber strands 323, 325 (Beer, column 6, lines 53-57). Therefore, Beer teaches a solution to the problem of increased strength other than adding the proposed redundant structure, thereby teaching away from the proposed redundant structure.

Because both Vane and Beer already successfully provide sufficient strength for their intended applications and a mechanism to further increase the strength as needed, increasing the strength of the mats of Beer or Vane cannot supply the required motivation for the proposed combination. Consequently, the references clearly lack the required suggestion or motivation for the proposed combination.

d. The Proposed Combination Produces a Redundant Structure.

Neither Vane nor Beer contain any teaching or suggestion for employing two structures to secure the reinforcing fibers in a fixed relationship relative to one another. To do so would introduce a redundant structure to the reinforcing material. Putting aside the additional cost, increased thickness and handling difficulties associated with the proposed redundant structure, adding a needled batting material to a stitched reinforcing material exceeds what both Vane and Beer deemed necessary to produce the desired results. That is,

Vane and Beer both teach a solutions deemed sufficient to solve the identified problem. Vane and Beer did not disclose redundant structures because they did not need them. Absent any recognition in Vane (or Beer) for the proposed redundant structure, some other motivation must be found. No such motivation has been identified, nor is one present in the cited references.

Because no other motivation for the proposed combination has been provided, Applicants submit that the rejection fails. Applicants respectfully submit that claims 13-28 and 65-102 are patentable over the cited references.

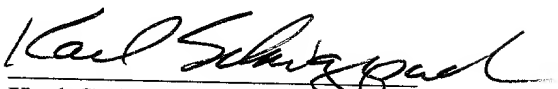
Conclusion

When properly interpreted and considered, there is no suggestion or motivation to combine the cited references in the manner proposed. Accordingly, claims 13-28 and 65-102 are allowable over the cited references of record. Applicants respectfully request that the Board reverse the outstanding rejection of the pending claims and that the application be returned to the Examiner for processing in accordance with that reversal.

A credit card payment in the amount of $430.00 covering the fee of $110.00 for a 1-month extension of time and $320.00 fee for filing a brief in support of this appeal is enclosed. No additional fee is necessary. Should an additional fee be required, however, the Commissioner is authorized to charge our deposit account no. 06-0029 and notify us of the same.

Respectfully Submitted,

KENNETH D. BEER et al.

By: 

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APPENDIX

Pending Claims

13. A mat for use as reinforcement for a resin composition to be used in forming an elongated, pultruded part of constant transverse cross-section using a pultrusion die, said mat comprising:

a first layer of continuous, generally longitudinally-extending fibers which provide longitudinal strength to the mat;

a second layer of generally transverse reinforcement fibers in association with the first layer of generally longitudinal fibers and oriented in a direction at an angle with respect to the longitudinal pull direction of the mat to provide transverse strength to the mat;

a third layer of diagonal transport fibers for the transverse reinforcement fibers, at least certain of the transport fibers extending diagonally of the first layer of generally longitudinally-extending fibers and oriented to provide shear strength stiffness and anti-skewing resistance to the mat; and

a batting layer comprising polymeric fibers, at least a portion of which extend through the thickness of the mat layers and interconnect the fibers of all of the layers to increase the shape-retaining capability of the mat during pultrusion of the part.

14. The mat of claim 13 wherein said batting layer is bonded to the other layers of the mat forming a monolithic body.

15. The mat of claim 13 wherein is provided a binding agent which bonds the mat layers into a monolithic body.

16. The mat of claim 13 wherein at least a portion of the batting layer fibers extend through the thickness of the mat layers and which extend through and interconnect the mat layers, are entangling fibers.

17. The mat of claim 16 wherein the entangling fibers are formed of a cut-staple material.

18. The mat of claim 16 wherein the fibers of the first layer are formed of glass and the entangling fibers are of a synthetic resin polymer.

19. The mat of claim 16 wherein at least certain of the entangling fibers are heat bonded to the fibers of the other layers of the mat.

20. The mat of claim 13 wherein a first portion of the transport layer fibers extend diagonally from one side of the mat to the other side and a second portion of the transport layer fibers extend diagonally from said other side to said one side.

21. The mat of claim 20 wherein the angle of the fibers of the first and second portions of the transport layer with respect to the longitudinally-extending fibers of the first layer is essentially the same.

22. The mat of claim 21 wherein the fibers of each of the first and second portions lie along respective straight lines at a common angle with respect to the line of the pull of the mat.

23. The mat of claim 13 wherein the fibers of said third transport layer are disposed at an angle in the range of about +30° to about +60° from about –30° to about –60° with respect to the longitudinal length of the fibers of the first layer.

24. The mat of claim 23 wherein the transport layer of fibers extend at opposite angles of about +45° and about –45° with respect to the longitudinally-extending fibers of the first layer.

25. The mat of claim 13 wherein the transverse reinforcement mat fibers are oriented in a direction at an angle of from about 60° to about 90° with respect to the longitudinally-extending fibers of the first layers.

26. The mat of claim 25 wherein the transverse reinforcement mat fibers are oriented in a direction at an angle of about 90° with respect to the longitudinally-extending fibers of the first layers.

27. A mat for use as reinforcement for a resin composition to be used in forming an elongated, pultruded part of constant transverse cross-section using a pultrusion dies, said mat comprising:

a first layer of continuous, generally longitudinally-extending fibers which provide longitudinal strength to the mat;

a second layer of generally transverse reinforcement fibers in association with the first layer of generally longitudinal fibers and oriented in a direction at an angle with respect to the longitudinal pull direction of the mat to provide transverse strength to the mat; and

a batting layer comprising polymeric fibers, at least a portion of which extend through the thickness of the mat layers and interconnect the fibers of all of the layers to increase the shape-retaining capability of the mat during pultrusion of the part, the batting layer being bonded to the other layers of the mat.

28. The mat of claim 27 wherein the generally longitudinally-extending fibers of the first layer includes fibers which extend at an angle of from about 0° to about +20° and from about 0° to about –20° relative to the direction of the pull of the mat.

65. A reinforcement mat adapted for use in manufacture of a pultruded part where the mat is pulled through a pultrusion die in a continuous longitudinal pull direction, said mat comprising:

a body having a pair of opposed outer surfaces which define the thickness of the mat, said body including elongated reinforcing fibers oriented in a direction transverse to said pull direction; and

batting material in contact with said reinforcing fibers and including polymeric staple fibers, a certain proportion of said staple fibers extending through at least a portion of said mat thickness and randomly entangled with and interconnecting said reinforcing fibers.

66. A reinforcement mat as set forth in claim 65, wherein the entangling staple fibers which extend through at least a portion of the mat thickness are hydro-entangled fibers.

67. A reinforcement mat as set forth in claim 65, wherein the reinforcing fibers extend substantially across the full transverse width of the mat.

68. A reinforcement mat as set forth in claim 65, wherein said generally transverse reinforcing fibers are disposed at an angle of about 60° to about 90° with respect to said longitudinal pull direction.

69. A reinforcement mat as set forth in claim 65, wherein said generally transverse reinforcing fibers are disposed at an angle of about 90° with respect to said longitudinal pull direction.

70. A reinforcement mat as set forth in claim 65, wherein is included transport fibers for the reinforcing fibers arranged at an angle to the reinforcing fibers, said

randomly entangled fibers extending through at least a portion of said mat thickness and interconnecting the transport fibers and the reinforcing fibers.

71. A reinforcement mat as set forth in claim 70, wherein said transport fibers include elongated fibers extending diagonally across substantially the full transverse width of the mat and at a predetermined angle with respect to said reinforcing fibers.

72. A reinforcement mat as set forth in claim 68, wherein said transport fibers include first and second elongated diagonal fibers extending diagonally across substantially the full transverse width of the mat with the first diagonal fibers oriented at an angle opposite the angularity of the second diagonal fibers.

73. A reinforcement mat as set forth in claim 72, wherein is provided transport fibers disposed at an angle in the range of about + 30° to about + 60° and transport fibers disposed at an angle of about – 30° to about – 60° with respect to the longitudinal pull direction.

74. A reinforcement mat as set forth in claim 73, wherein is provided transport fibers disposed at an angle of about + 45° and second transport fibers disposed at an opposite angle of about –45° with respect to said longitudinal pull direction.

75. A reinforcement mat as set forth in claim 65, wherein is provided a synthetic resin binder binding the entangling fibers with the reinforcing fibers.

76. A reinforcement mat as set forth in claim 65, wherein at least some of the entangling fibers are heat bonded to the transverse reinforcing fibers.

77. A reinforcement mat as set forth in claim 65, wherein the entangling fibers have a bending resistance less than that of the reinforcing fibers.

78. A reinforcement mat as set forth in claim 68, wherein said transport fibers include elongated fibers extending substantially in said longitudinal pull direction.

79. A reinforcement mat as set forth in claim 70 wherein said elongated transport fibers include stitch defining fibers extending in said pull direction of the part.

80. A reinforcement mat as set forth in claim 79, wherein said reinforcing fibers are of glass and said elongated stitched fibers are of a polyester resin.

81. A reinforcement mat as set forth in claim 78, wherein said elongated fibers include fibers which extend an angle of from about 0° to about +20° and from about 0° to about –20° relative to said longitudinal pull direction.

82. A reinforcement mat as set forth in claim 65, wherein is provided a series of perforated holes through the thickness of the mat.

83. A reinforcement mat as set forth in claim 82, wherein the series of holes through the thickness of the mat are punched holes.

84. A reinforcement mat as set forth in claim 82, wherein said holes are filled with a resin which increases the reinforcement properties of the reinforcing fibers.

85. A reinforcement mat adapted for use and manufacture of a pultruded part where the mat is pulled along with longitudinal fibers through a pultrusion die in a continuous longitudinal pull direction, said mat comprising:

a body presenting a pair of opposed outer surfaces defining the thickness of the mat,

said body including elongated reinforcing fibers oriented in a direction transverse to said pull direction and arranged to provide transverse strength to a pultruded part containing the mat; and

said body including fiber means including polymeric entangling staple fibers extending through at least a portion of said mat thickness and randomly entangled with said reinforcing fibers, said fiber means being operable to carry the transverse fibers through the pultrusion die and to provide longitudinal strength, shear strength and anti-skewing resistance to the mat during pultrusion of a part reinforced with the mat.

86. The reinforcement mat according to claim 85, wherein said fiber means includes at least one layer of randomly oriented staple fibers and at least one layer of transport fibers arranged at an angle to the reinforcing fibers.

87. The reinforcement mat according to claim 86, wherein said transport fibers include elongated fibers extending diagonally across substantially the full transverse width of the mat and at an angle with respect to said reinforcing fibers.

88. The reinforcement mat according to claim 87, wherein said fiber means includes first and second elongated diagonal fibers extending diagonally across substantially the full transverse width of the mat with the first diagonal fibers oriented at an angle opposite the angularity of the second diagonal fibers.

89. The reinforcement mat according to claim 86, wherein said transport fibers includes elongated fibers extending substantially in said longitudinal direction.

90. The reinforcement mat according to claim 87, wherein said transport fibers includes elongated fibers extending substantially in said longitudinal direction.

91. The reinforcement mat according to claim 86, wherein said transport fibers includes elongated fibers extending substantially in said longitudinal direction.

92. The reinforcement mat according to claim 89, wherein said elongated transport fibers comprise stitched fibers.

93. The reinforcement mat according to claim 85, wherein the fiber means includes a binder interconnecting the reinforcing fibers and the fiber means of the mat.

94. The reinforcement mat according to claim 85, wherein the entangling staple fibers which extend through at least a portion of the mat thickness are hydro-entangled fibers.

95. The reinforcement mat according to claim 85, wherein the entangling fibers have a bending resistance less of that of the reinforcing fibers.

96. The reinforcement mat according to claim 85, wherein at least some of the entangling fibers are heat bonded to the transverse reinforcing fibers.

121. The mat of claim 13 comprising a permeability of about 200 to about 400 cubic feet per minutes of air at a pressure differential of 0.5 inches of water.

122. The mat of claim 13 comprising a permeability of about 600 to about 800 cubic feet per minute of air at a pressure differential of 0.5 inches of water.

123. The mat of claim 65 comprising a permeability of about 200 to about 400 cubic feet per minute of air at a pressure differential of 0.5 inches of water.

124. The mat of claim 65 comprising a permeability of about 600 to about 800 cubic feet per minute of air at a pressure differential of 0.5 inches of water.

125. The mat of claim 85 comprising a permeability of about 200 to about 400 cubic feet per minute of air at a pressure differential of 0.5 inches of water.

126. The mat of claim 85 comprising a permeability of about 600 to about 800 cubic feet per minute of air at a pressure differential of 0.5 inches of water.